

# Challenges and Lessons Learned:

## Building VDOT's Enterprise GIS Using State of the Art Technology

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## Presentation Overview

- Overview of Project Goals
- Enterprise Data Considerations
- Enterprise Architecture



## Background

- Vision established in 1997-1998 for an enterprise approach to support future spatially enabled apps
- No vendor's COTS product was able to meet all requirements without major customization
- Project scope changed - no longer custom, but Commercial Off The Shelf (COTS)
- After evaluation ESRI's ArcSDE / ArcIMS / Oracle solution selected
- VDOT staffed their GIS Program to oversee development, testing and production



## System Objectives

- Link business data to spatial data (LRS key)
- Serve traditional information to VDOT users in graphic format
- Provide a single point of access for enterprise spatial data for fat and thin clients
- Standardize spatial parameters to simplify the integration of various spatial data sets



## System Objectives (Continued)

- Map server for query and display of maps through VDOT's intranet browsers
- Callable interface (API) accessible by popular programming languages and GIS scripts
- Integration of VDOT's multiple Linear Referencing Systems on common reference frame
- Integrated help to promote user friendliness



## Objectives to be Phased-In as Industry Matures

- On-the-fly location referencing system conversions for disparate data including local data
- Information locator with strong metadata content
- Custom thin client interfaces
- Linkage to real time information such as ITS data



## Who will the GIS Integrator Serve?

- Internal VDOT users
  - Used as a GIS data repository
  - Used as a model to build similar web-based projects in other VDOT business units
- Eventually Internet
  - Customer information system
  - Interagency data sharing



## Enterprise Data Considerations

Melanie Seigler  
GIS Applications Manager



## Critical Data Issues

- Availability – what do we have to work with
- Quality – legacy systems, no standards, locational information
- Preprocessing – formats, projections
- Volume – 60,000 miles of road over a large area, 1.2 TB of aerial photography



## Data Layers

- Roads (All, Grouped, Measured shapes, ICAS Centerlines, Six-Year Improvement Program)
- Imagery - DOQQ & Right-of-Way
- Jurisdictional boundaries and water bodies
- Business Data: (Traffic, Accidents, Data Warehouse linkage to certain layers)





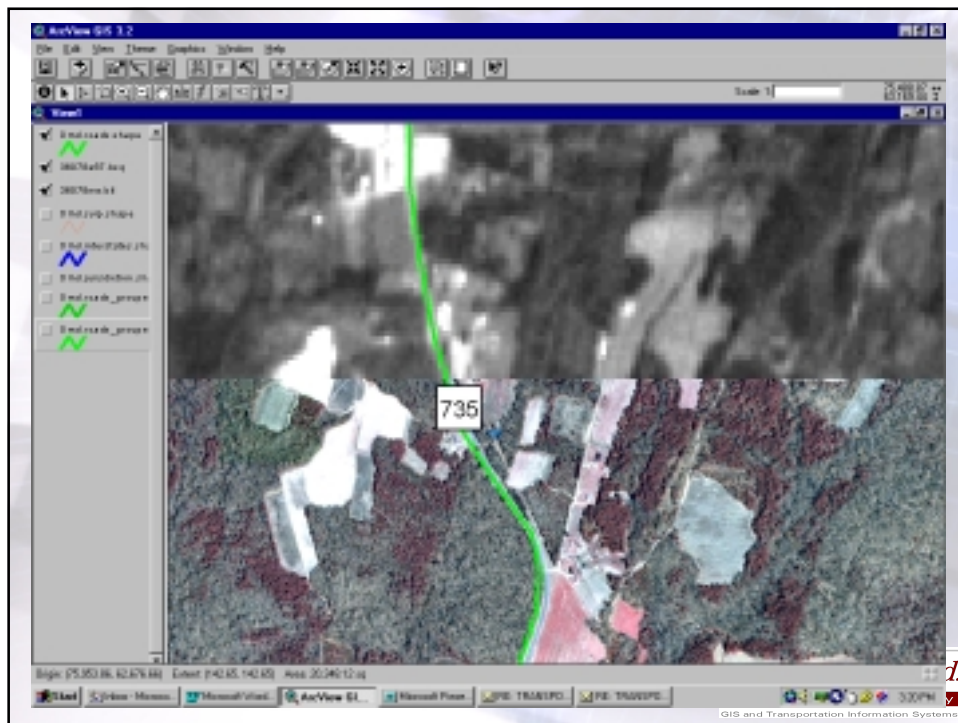
# Imagery

## • ROW Imagery

- Obtained through Maintenance centerline data collection effort
- forward images every 10<sup>th</sup> of a mile (52 ft)

## • USGS Digital Ortho Quarter Quad

- 1994-2000, color IR and/or black and white, 1m, 1:12000
- 1.2 TB of images



## Business Data

- Hosted as Materialized Views
- Spatially indexed
- Some data cleansing - LRS



## Near Term Data Plans

- Data:
  - County Map Centerlines to ICAS Centerlines
  - Replace current LRS with ICAS LRS
  - Updated Imagery when available
  - More linkages to business data
  - Environmental Data (NWI, soils, T&E)



# Enterprise Architecture Considerations

Naveed Sami  
Director of Technology  
Maintenance Division



## Critical Design Issues

### • Business Needs

- 200 Concurrent Users over a Wide Area Network
- 2 TB of Imagery

### • Resulting System Needs

- Large number of hard drives on data servers
- Massive Data Backup
- High bandwidth required between all servers
- Significant Performance Tuning





## Solutions

- Separate Business/Vector from Image data
- Configure for large Parallel I/O
- Group Vectors based on query needs
- Physically store feature tables in Spatial Index order
- Scale dependant rendering
- Thorough testing with custom designed Stress Testing Utilities



### Two Data Servers

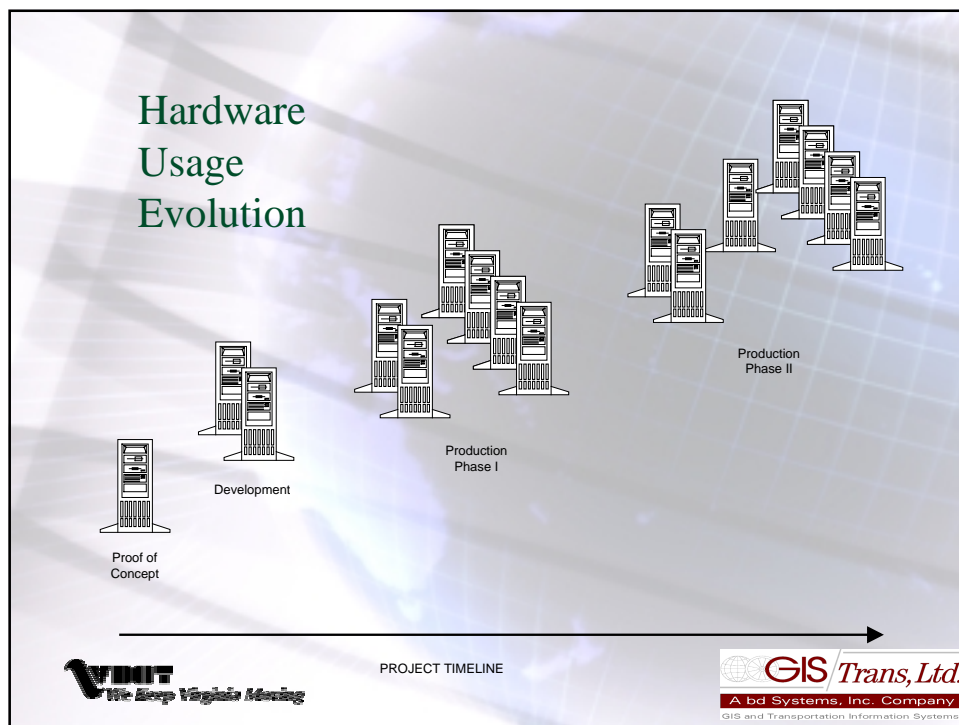
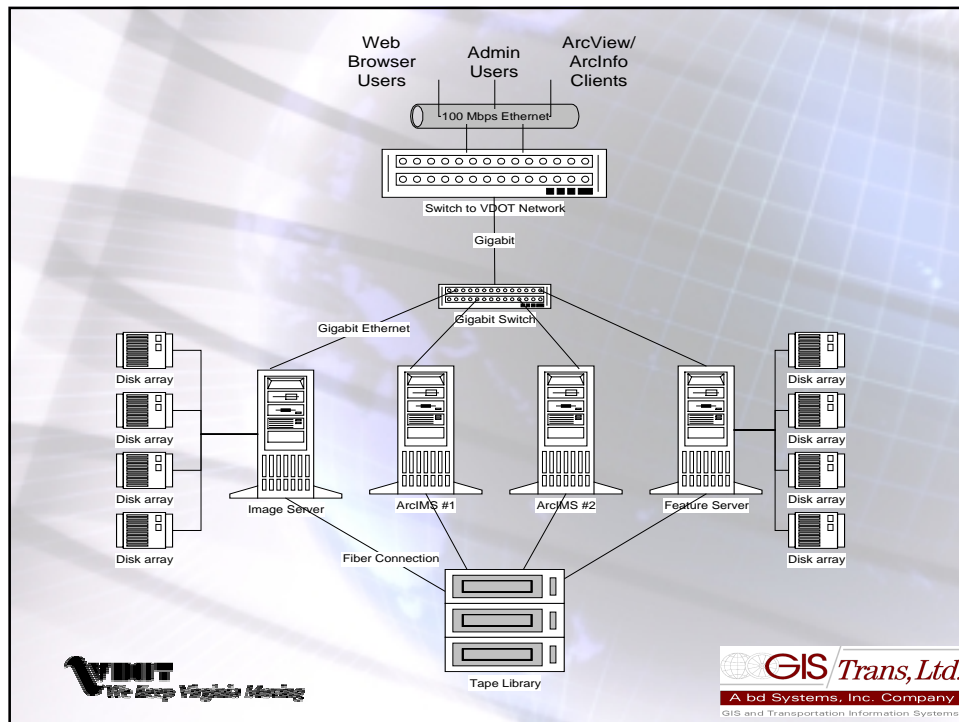
- Vector/Business
- Image
- Hardware
  - Quad CPU
  - 4GB RAM
  - 60 18GB hard drives
- Software
  - SDE
  - Oracle
  - Windows NT



### Two Application Servers

- Hardware
  - Quad CPU
  - 4 GB RAM
  - 2 18 GB hard drives
- Software
  - ArcIMS
  - IIS
  - Windows NT





## Future Plans

- Incorporate new COTS functionality as available
- Performance Tuning (on-going)
- Just-In-Time Hardware Acquisition
- Support application needs of VDOT business units
- Provide common architecture that other business units can build their GIS on.



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